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**Marine Casualty
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**Enquêtes sur les
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**Investigation
Report
to the Minister
pursuant
to sections
542 or 545
of the
Canada
Shipping Act**

**Rapport
d'investigation
au Ministre
conformément
aux articles 542
ou 545 de la Loi
sur la marine
marchande
du Canada**

Canada

Ce rapport est aussi disponible en français

REPORT OF INVESTIGATION INTO THE
INJURY SUSTAINED BY A LONGSHOREMAN
WHEN RUN OVER BY A TRACTOR ON BOARD THE
BERMUDA REGISTERED VESSEL "IRVING TIMBER"
AT SAINT JOHN, NEW BRUNSWICK,
MARCH 20, 1987.

REPORT No. 492

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REPORT OF INVESTIGATION INTO THE INJURY SUSTAINED BY A
LONGSHOREMAN WHEN RUN OVER BY A TRACTOR ON BOARD THE BERMUDA
REGISTERED VESSEL "IRVING TIMBER" AT
SAINT JOHN, NEW BRUNSWICK, MARCH 20, 1987

Vessel Particulars

Name	"IRVING TIMBER"
Official Number	706990
Port of Registry	Hamilton, Bermuda
Call Sign	VSBT2
Gross Tonnage	7,087.27
Net Tonnage	4,693.09
Length	118.77 m
Breadth	20.03 m
Depth	11.73 m
Draught	F: 7.32 m A: 7.39 m
Type	Steel Ro/Ro
Built	1978, Lubeck
Propulsion	Twin screw, 2 MAK diesel engines, 4476 kW total
Cargo	3,872 tonnes, steel, news- print rolls, corrugated medium paper, timber and containers.
Crew	24 (including Master)
Classification	Germanischer Lloyd
Owners	Gainvir Transport Ltd. Hamilton, Bermuda
Local Agent	Kent Line Limited Saint John, N.B.

Description of Vessel

The "IRVING TIMBER" is a steel cargo vessel, with the navigating bridge and accommodation forward, while the propulsion machinery is located aft.

Constructed to a Roll on, Roll off design, access to the vessel's 'tween deck area is via a stern mounted ramp and door.

The "IRVING TIMBER" is employed in the general cargo trade between Saint John, New Brunswick and Caribbean ports.

Description of Tractor

Manufacturer	John Deere
Model Number	2950 (1986 Production Model)
Type	Four-wheel drive industrial tractor, with an enclosed cab
Engine	Diesel, 6 cylinder, 63 kW (net)
Owners	Forest Products Terminal Corporation Limited, Saint John, N.B.

This tractor unit, identified as number 3042, was acquired by the terminal operator as a new vehicle during February 1986. Since that time the tractor has accumulated 989 operating hours.

Note: All times in this report are expressed in Atlantic Standard Time (UTC minus 4 hours)

Background

During the morning of March 20, 1987, the M.V. "IRVING TIMBER" was loading cargo at Saint John, N.B. During the loading operation, a driver left his tractor while on the loading ramp and was subsequently run over by the unit when attempting to re-enter the cab.

The driver suffered multiple fractures to his lower body and was transported to hospital for treatment. The tractor's hitch was damaged; however, there were no further injuries or major damage reported as a result of this accident.

Particulars of Injured

Name	Thomas Cobham
Occupation	Longshoreman, Tractor driver
Age	41 years
Address	Saint John, New Brunswick

Narrative

The "IRVING TIMBER" had arrived in Saint John, N.B. on March 15, 1987 and began to load 3,872 tonnes of cargo consisting of steel, newsprint rolls, corrugated medium paper, timber and containers destined for various Caribbean ports.

The loading process was uneventful until March 20. By this time 166 rolls of corrugated medium paper remained to be loaded before the "IRVING TIMBER" would shift to the container terminal and embark the balance of cargo.

At 0800, the terminal personnel started work, however, they did not begin to load the balance of the roll on/roll off cargo as the ramp angle was considered excessive. The terminal personnel were occupied with other tasks and, as the tide was rising, the ramp was sighted at various times to determine when loading could begin.

During the morning, prior to the loading and as the "IRVING TIMBER" rose with the tide, the vessel's stern ramp was adjusted accordingly by a deck officer.

At approximately 0945, a tractor and trailer unit was loaded with 2 rolls of corrugated medium paper in preparation for the loading process. By 1000, it was decided the ramp angle had decreased sufficiently and loading began. As there was not adequate space in the 'tween deck area for the tractor and trailer to drive on, unload, turn and drive off, the units were being backed down the ramp. At approximately 1030, a unit was attempting to back down the ramp when a trailer, loaded with 2 rolls of paper, became disconnected from a tractor. The operator of a clamp lift truck, working in the 'tween deck, saw the detached trailer rolling down the ramp and immediately attempted to move his vehicle out of the way. In spite of his actions, the detached trailer stopped only upon striking his vehicle and the cargo. Fortunately, damage was minimal and there were no injuries.

Paper rolls were then loaded on the front end of the trailer to enable the tractor to re-connect. The unit was unloaded, then the tractor and trailer drove up the ramp without further difficulty.

At approximately 1040, another tractor and trailer unit, loaded with 2 corrugated paper rolls, attempted to back down the ramp. By this time the ship's ramp was at an estimated 20° to 30° angle and approximately 10 to 15 cm. above the concrete dock ramp.

The trailer backed on the ramp without difficulty, however, the tractor's hitch became caught on the end of the ramp. The driver attempted to move his unit both ahead and back, however, the tractor held fast. The driver applied the tractor's hand parking brake, put the transmission control lever in the neutral position and left the cab to assess the situation. Moments later, while discussing the situation with other terminal personnel, the driver noticed the tractor and trailer begin to move down the ramp. The driver immediately attempted to climb back into the cab; however, at that moment he slipped and fell, as the left front wheel of the tractor rolled over his left leg, right ankle and lower torso. The tractor and trailer continued on down the ramp until the unit ran into the cargo and stopped.

Immediately, a supervisor, who had observed the accident called to his office via a portable radio and requested an ambulance. Ports Canada Police and Coast Guard Ship Safety personnel were advised of the accident and immediately proceeded to the scene.

By 1048, Ports Canada Police had escorted the ambulance to the "IRVING TIMBER" and minutes later the injured driver was being transported to hospital.

The loading process was delayed while Coast Guard and Ports Canada Police conducted an investigation, however, the "IRVING TIMBER" subsequently loaded the balance of her container cargo and departed Saint John at approximately 0030, March 21, 1987.

Analysis

1. Weather

When the accident occurred, weather was reported as clear with variable light winds and an air temperature of 3°C. Although there was some snow accumulation, the ramp and dock areas were clear and dry.

It would appear weather conditions were not a contributing factor in this accident.

2. Tidal conditions

Predicted low tide at Saint John, N.B. on March 20, was at 0855, with a height above chart datum of 1.1 m. High tide was predicted at 1455, with a 7.2 m height above chart datum. When the accident occurred at approximately 1040, the tide would have been rising for 1 hour 45 minutes. During this time the tide would have risen to approximately 2.4 m above chart datum or 0.62 m from the time loading was started at 1000.

3. Stern ramp

A stern loading ramp is fitted to the "IRVING TIMBER" and provides access to the vessel's 'tween deck space when loading roll on/roll off cargo. The ramp is fabricated of steel and when in the stowed position, provides a watertight stern door.

Constructed in three sections, the ramp has an overall length of 21 m, with a breadth of 8.37 m. The longest section of 17 m, is designed to pivot from the vessel's stern at approximately a 7° angle above or below a horizontal plane. A section 3 m in length provides a landing for the ramp at a shore side facility and is also designed to pivot from the longest section of the ramp. A hinged flap section, 1 m in length, is fitted to the end and provides an easy entry onto the ramp.

The ramp does not automatically compensate for tidal conditions and must be raised or lowered from a central station located near the top of the starboard stern gantry frame. The control station consists of two levers which will raise or lower the ramp at a fast or slow rate and operates a system of hydraulics, cables and pulleys. The position of the control station provides a clear view of the ramp.

The ramp is fitted with preventer wires which, according to a manufacturer's drawing, limit its angle to 7° below a horizontal plane. The drawing also indicates a maximum angle of 7° above the horizontal as an upper limit, with the pivoting landing section of the ramp on a level plane.

Lengths of steel flat bar are welded to the ramp surface in a "herring-bone" pattern, providing traction for the vehicles while working cargo.

The vessel has been in operation, and using the stern ramp in a similar fashion, since 1979. Reportedly this is the first accident resulting in injury involving the use of the ramp of which the ship's crew is aware.

4. Loading operation

During the loading operation prior to the accident, the "IRVING TIMBER" was berthed port-side to, at number 1A Forest Products Terminal, with the vessel's stern ramp landing on a concrete ramp incorporated in the wharf structure.

Reportedly, the incline of this concrete ramp is 1:10 to 1:8, or an approximate 5° to 7° angle.

The loading operation was continuous; however, at approximately 0745, March 20, it was stopped due to the increasing ramp angle with the ebbing tide. When the new shift began work at 0800, it was determined that the ramp incline was too steep to allow cargo to be loaded safely and personnel were detailed to other tasks.

Generally, as in this instance, the tractor drivers' experience determines if a ramp incline is too steep for safe cargo working.

At approximately 0945, a tractor trailer unit was loaded with two, instead of the normal six, rolls of corrugated medium paper totalling an estimated 3.4 tonnes.

By 1000, the drivers agreed to resume loading, as the ramp angle had decreased, and that each trailer load would consist of two rolls of paper.

Due to space restrictions in the 'tween deck, tractors and trailers were backing down the ramp to be unloaded by clamp trucks. After the paper rolls were removed by the clamp truck, the tractor and trailer would be driven up the ramp and return to the storage area to be reloaded.

When working cargo on board the "IRVING TIMBER", three, four-wheel drive tractors are used instead of the normal two-wheel drive units, due to the ramp incline.

The loading operation was being supervised by the stevedore superintendent, who was also responsible for simultaneous cargo work on another vessel berthed nearby.

On board the "IRVING TIMBER" a deck officer was overseeing and attending to the vessel's responsibilities with regard to the cargo operation.

5. Disconnected trailer incident

At approximately 1035, one of the trailers became disconnected from its tractor while being backed down the ramp and hit a clamp truck and the cargo in the 'tween deck before stopping.

Fortunately, there were no injuries and damage to the clamp truck and cargo was minor.

As the two rolls of paper had shifted to the end of the trailer upon contact with the clamp truck and cargo, additional rolls were loaded on the unit to bring its front end down to enable it to be reconnected to the tractor.

The unit was then unloaded and driven up to the ramp and proceeded to the mechanical repair shop. At this time the tractor hitch system was given a summary inspection, however, a reason for the unit becoming disconnected could not be determined.

The tractor hitch system consists basically of a hydraulically operated pin, which fits through a hole bored in the trailer tongue. The hitch is operated by a lever in the tractor cab and is located where accidental movement would be unlikely.

Since this incident, the hitch system hydraulic lines on the tractors have been fitted with valves. Now, after a tractor and trailer have been connected, the valves are closed. This provides a positive pressure and prevents movement within the hydraulic cylinder which operates the pin.

6. The accident

At approximately 1040, a tractor and trailer unit loaded with two rolls of paper began to back down the ramp to the vessel's 'tween deck. While backing on to the ramp, a protruding bracket incorporated in the hitch system, became caught on the apex formed by the flap and landing sections of the vessel's stern ramp. The driver made various attempts to move his vehicle both ahead and back, however, the unit remained immobile. He then adjusted his vehicle's transmission control to the neutral position, applied the hand brake and left the

cab to assess the situation.

At about this time, a deck officer standing in the vessel's 'tween deck area proceeded towards the control station in order to lower the ramp, after noticing the tractor and trailer was not able to move.

The tractor was observed to be situated with its rear wheels on the flap and the trailer wheels on the main section of the vessel's ramp. A coil spring and bracket located underneath the tractor's hitch had become distorted and was disconnected upon contact with the ramp apex.

Moments later, while the driver was standing on the ramp discussing the situation with a supervisor and another driver, the tractor and trailer began to move down the ramp towards the 'tween deck. Concerned that the runaway unit might hit personnel working in the 'tween deck, the driver attempted to get back into the cab and stop the tractor. As he held on to a hand rail and was attempting to step up and open the cab door, he slipped and fell under the left front wheel of the tractor. The tractor rolled over the driver's left leg, right ankle and mid body, continued down the ramp and stopped in a "jack-knife" position after striking the cargo in the 'tween deck.

7. Stern ramp operation

At various times throughout the morning, the stern ramp was lowered approximately 10 to 15 cm to the concrete ramp surface as the "IRVING TIMBER" rose with the incoming tide. Prior to the accident it is estimated that the vessel's stern ramp was lowered by a deck officer on six or seven occasions during an hour. The ramp was last lowered at approximately 1030, just after the runaway trailer incident. At approximately 1040, upon observing that a tractor and trailer unit was unable to move, a deck officer proceeded to the control station in order to lower the ramp.

Estimates of the vessel's ramp angle at that time vary, with up to 30° being reported. Based on information obtained from the vessel's drawings and photographs taken immediately after the accident, an angle of approximately 14° is more likely.

8. Cause of the accident

Witnesses to the accident, some standing on the ramp and

others nearby, reported being able to feel the stern ramp move, while others did not.

Statements were made to the effect that a member of the vessel's crew was seen lowering the stern ramp, however, it would appear these impressions were based more on assumption than observation.

A deck officer was at the control station when the accident occurred but maintains the ramp had not yet been adjusted.

It would appear that movement of the ramp would have been necessary to dislodge the tractor from the ramp apex, as the unit was unable to drive either ahead or back when it became immobilized.

There was no reported vessel traffic in the area prior to the accident, sufficient to cause a wash, however, a tug proceeded alongside the "IRVING TIMBER" at 1043, to assist in shifting to another berth. It is unlikely the tug caused any movement of the "IRVING TIMBER" as the vessel reported at call-in-point 8 at 1037, some 0.75 miles from pier 1A.

Reportedly, the stern ramp is considered a stable platform and does not have a history of unexplainable movement.

9. Condition of tractor and trailer

At the request of Ports Canada Police a motor vehicle mechanic, experienced in heavy equipment maintenance and repair, boarded the "IRVING TIMBER" shortly after the accident and conducted a visual inspection of the tractor. Upon inspection, the tractor's auxiliary transmission lever was found to be in the neutral position and the hand parking brake engaged.

It would appear to be normal practice, when operating diesel-powered equipment, to allow the engines to run at idle rather than shut down for short periods, especially during cooler ambient temperature conditions.

During the inspection the hand parking brake lever was released, then re-engaged in the position as originally found. With some extra effort it was discovered that the lever could be moved slightly past this position.

Although none of the tractor's mechanical components were dismantled, it was determined from a visual

inspection and by testing that both the foot and hand parking brakes were considered to be operating normally.

The trailer, approximately 6 m in length, appeared to be in good condition, however, the unit is not fitted with a braking system.

Regular maintenance of mobile equipment is routinely conducted by terminal personnel in a mechanical repair shop located on the premises. When considered necessary, terminal personnel are advised and assisted by equipment manufacturers' representatives.

Terminal personnel consider the four-wheel drive tractors to be superior in performance when compared to similar two-wheel drive units.

There would appear to be no evidence that suggests mechanical failure of the tractor and trailer unit contributing to the accident.

10. Regulatory

Since being recently promulgated, the Marine Occupational Safety and Health Regulations, made under Part IV of the Canada Labour Code, apply to employees engaged in the loading or unloading of ships in Canadian waters, with enforcement being delegated to Canadian Coast Guard, Ship Safety Officers.

It would appear the loading method being used when the accident occurred did not comply with sections of these regulations referring to the operation of mobile equipment or a ramp slope and unattended units.

However, the Marine Occupational Safety and Health Regulations did not become effective until April 2, 1987.

The Safe Working Practices Regulations made under the Canada Shipping Act also apply to persons employed in the loading and unloading of ships. These regulations refer to the use of mobile loading equipment and state in part that such equipment shall not be left unattended unless properly secured to prevent it from moving.

Although sections of the Safe Working Practices Regulations apply in general, there would appear to be no specific references to roll on/roll off cargo operations.

A court decision is pending resulting from charges by Ports Canada Police regarding a previous incident concerning the operation of a cargo handling vehicle. It is suspected that, should this case result in a successful prosecution, it will be established whether provisions of the Provincial Highways Act apply to cargo-handling vehicles operating on Ports Canada property. Such regulations would likely establish the requirements for various safety equipment, including trailer brake systems.

The "IRVING TIMBER" was in possession of valid documentation as required by the vessel's country of registry and international convention.

11. Subsequent action

Subsequent to this accident, the regulatory bodies conducted an investigation under provisions of the Canada Labour Code, Part IV, to immediately ensure a safe working environment and attempt to prevent a recurrence.

As a result of this investigation and consultations with union and employer representatives, the following remedial action was taken:

- the ramp slope is not to exceed 1:8 or approximately a 7% angle;
- drivers are to stop at the top of the ramp, then proceed down in low gear;
- drivers are not to leave a tractor unattended while on the ramp;
- supervision of the cargo operation was increased;
- the weight of the tractor, approximately 4,200 kg, and the cargo is not to exceed twice the weight of the tractor on a 1:8 ramp slope; and
- calcium was added inside the tractor tires in order to increase vehicle weight and traction.

In addition, instructions were issued to the "IRVING TIMBER" advising that it was the vessel's responsibility to keep the ramp lowered during cargo operations.

12. Experience and Qualifications

- (a) The master of the "IRVING TIMBER" had just returned from leave, having previously been in command of the vessel for 3½ months. He has been serving at sea since the age of 15 years, with 12 years of command experience and holds a Certificate of Competency as Master, Foreign Going, issued in the United Kingdom during February, 1966.
- (b) The deck officer overseeing the cargo loading operation had been serving on board the "IRVING TIMBER" for approximately 1 month. He had previously served as a deck officer in conventional cargo ships since 1978 and holds a Certificate of Competency as Second Mate, Foreign Going, issued in the United Kingdom during November, 1978.
- (c) The terminal manager is a professional engineer and has been employed in that position for 10 months. His responsibilities include routine terminal operations, organization of the labour force and scheduling equipment maintenance.
- (d) The stevedore superintendent has been employed in that position for 15 years and is responsible for general supervision of the cargo operation. He has been employed on the waterfront for 42 years.
- (e) The driver who was operating the tractor/trailer unit which became disconnected, has been employed at the terminal for approximately 8 years. He had previously been involved in many similar loading operations, both on board the "IRVING TIMBER" and other vessels. He is considered by his employer to be an experienced driver and has been operating one of the four-wheel drive tractors on a regular basis since they were acquired. He has been employed on the waterfront as a longshoreman since the age of 15 years.
- (f) Another driver, who was standing on the ramp when the accident occurred, has been employed at the terminal for approximately 4 years. He has also been involved in similar loading operations and being considered an experienced driver by his employer has operated one of the four-wheel drive tractors on a regular basis since they were acquired. He has been employed on the waterfront as a longshoreman over the past 12 years.
- (g) The injured driver has been employed at the terminal for approximately 8 years. During this period

he had been involved in similar cargo operations on board the "IRVING TIMBER" and other vessels. He is considered an experienced driver by his employer and has been operating one of the four-wheel drive tractors on a regular basis since they were acquired. He has been employed on the waterfront as a longshoreman during most of his adult life.

As a result of the accident, he suffered multiple fractures to his left leg, right ankle and pelvis. After medical treatment and a convalescence period of approximately one year, he is expected to be able to resume similar employment.

Findings

During a cargo handling operation on board the "IRVING TIMBER", March 20, 1987, a driver was run over by his tractor after it had become caught on a section of the vessel's stern ramp, due to improper loading practices.

It would appear the accident resulted from the following:

- the ramp was being used at a slope greater than that intended for normal operation;
- the ramp sections were not maintained at their optimum working level in relation to each other;
- the tractor/trailer unit was caught on an apex of two sections of the ramp;
- the tractor/trailer was left unattended only on the brake, when caught on the ramp;
- although the unit appeared to be immobile, the tractor/trailer began to move down the ramp;
- the hand brake friction was unable to stop the tractor and loaded trailer; and
- the driver was run over by the left front wheel of his tractor when he slipped and fell during an attempt to re-enter the cab and stop the vehicle.

It would further appear that:

- movement of the ramp would have been necessary in order to dislodge the tractor; and

- the ramp may have been either lowered inadvertently or moved due to some other unexplainable reason.

Other Findings

Immediate and subsequent action was taken by regulatory agencies in order to prevent a similar occurrence.

There would appear to be no evidence that mechanical failure of the tractor or trailer contributed to the accident.

The action by the injured longshoremen in attempting to stop the runaway tractor/trailer to prevent injuries to others, and possible damage, should be noted.

A previous incident on the ramp, a short while earlier, should have initiated some remedial action.

Had the stern ramp operating station been manned, immediate action could have been possible and the accident probably averted.

Had the operator of the tractor sought assistance without leaving his cab, the accident may have been prevented.

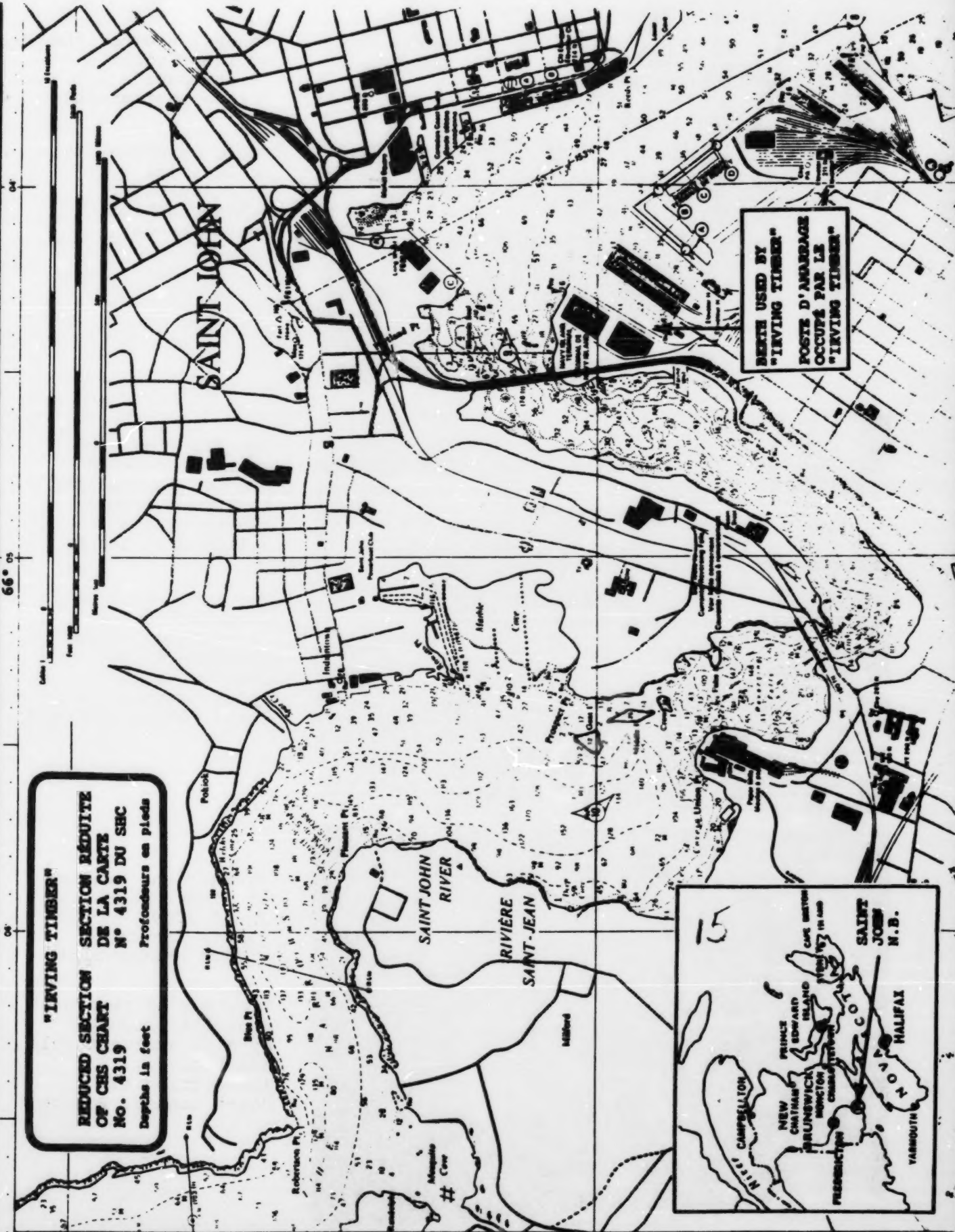
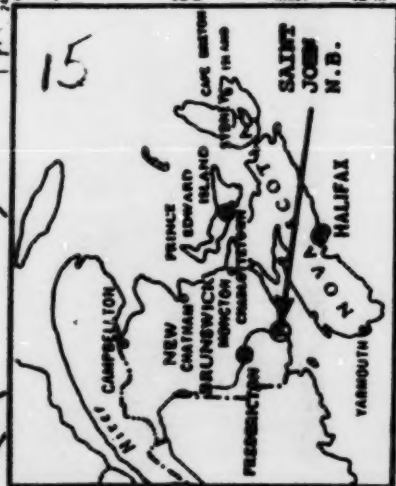
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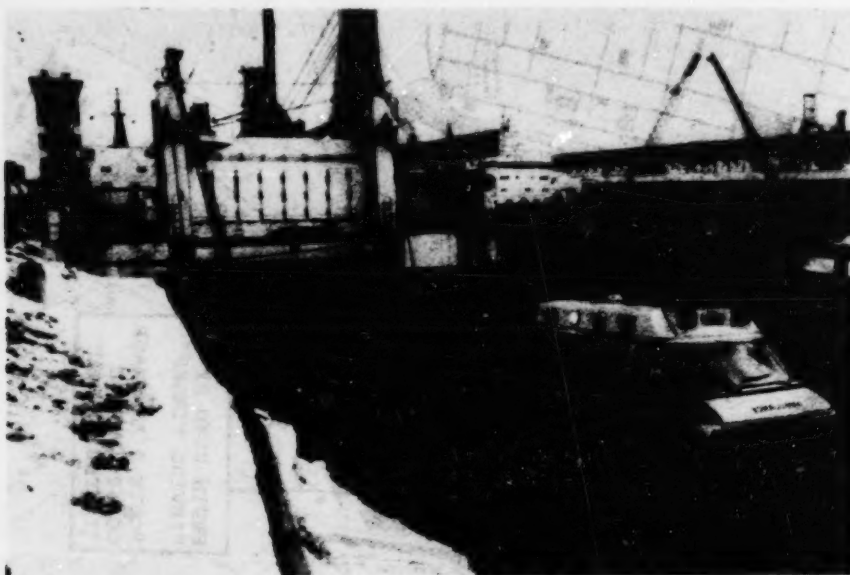
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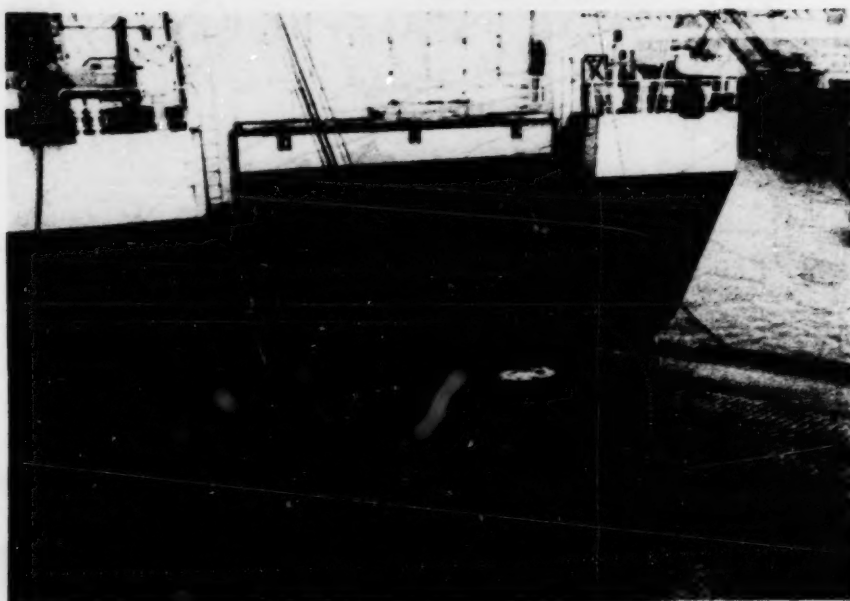
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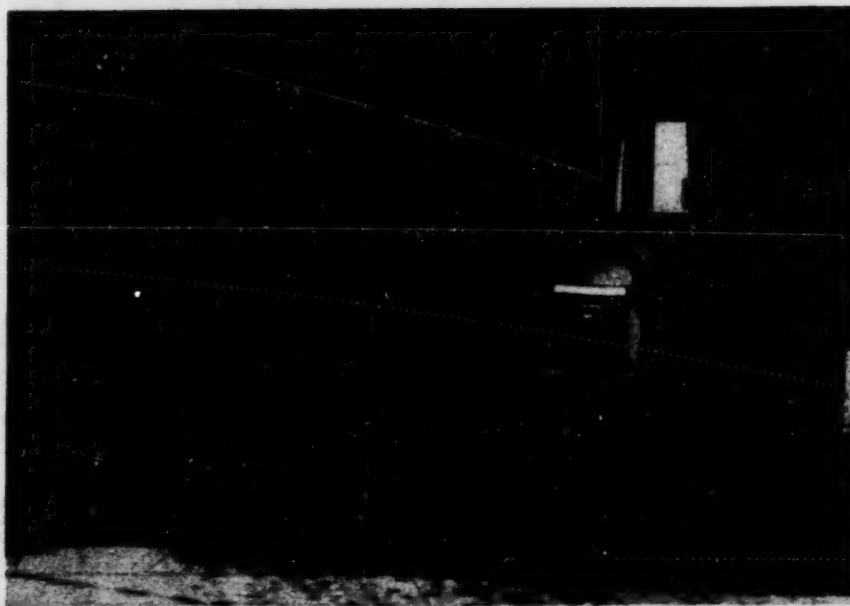
General view of the
accident scene.
(Ports Canada
Police photograph)

Vue d'ensemble
de la scène
de l'accident.
(photographie:
Ports Canada,
Police)



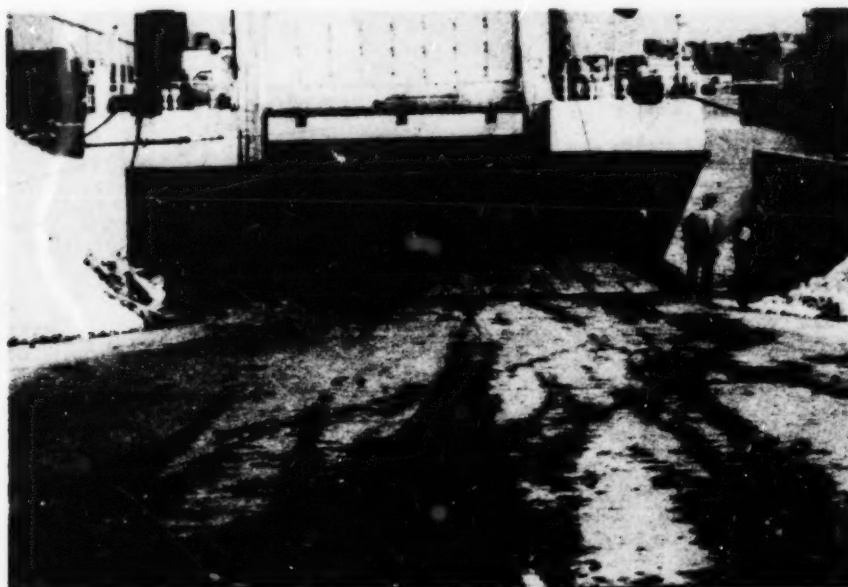
General view of
stern ramp, with
tractor and trailer
in 'tween deck.
(Ports Canada
Police photograph)

Vue d'ensemble de la
rampe arrière avec
le tracteur et la
remorque dans
l'entrepont.
(photographie:
Ports Canada, Police)



Tractor and trailer
in 'tween deck, as
found after accident.
(Ports Canada
Police photograph)

Tracteur et remorque
dans l'entrepont
après l'accident tels
que trouvés.
(photographie:
Ports Canada, Police)



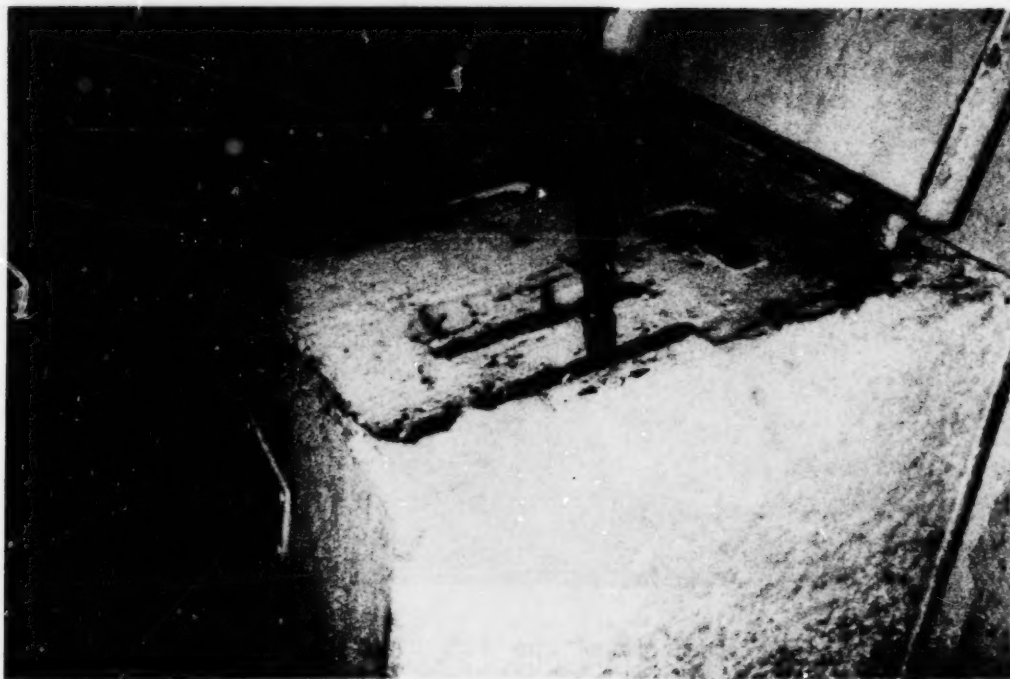
View of the area from the top of the concrete ramp.
(Ports Canada Police photograph)

Vue de la scène du haut de la rampe en béton.
(photographie: Ports Canada, Police)



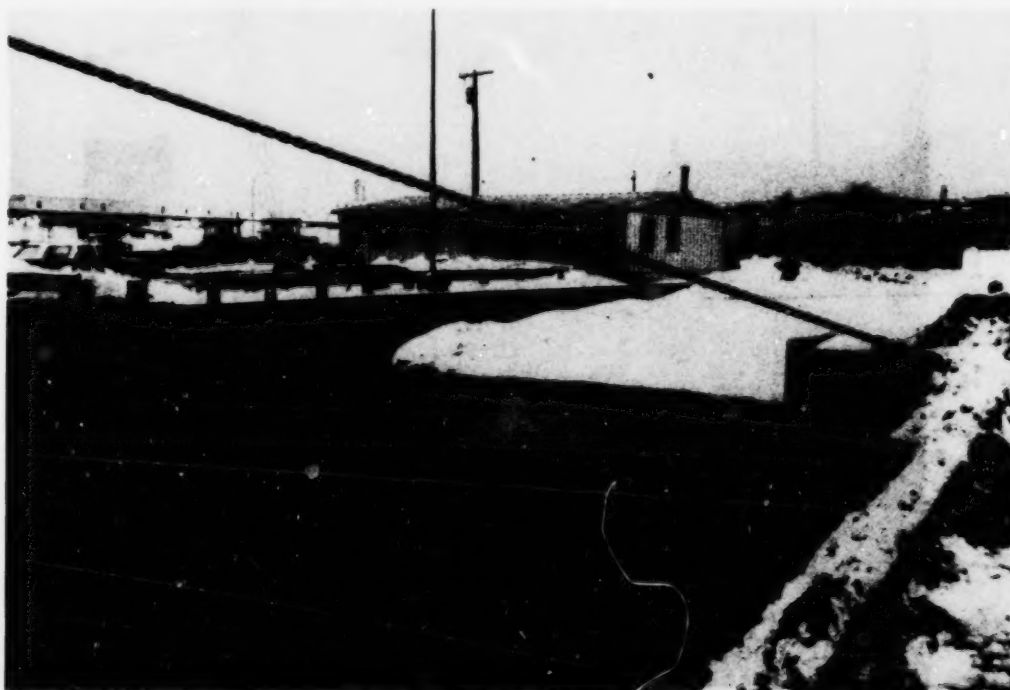
View of the ramp from vessel's 'tween deck.
(Ports Canada Police photograph)

Vue de la rampe de l'entrepont du navire.
(photographie: Ports Canada Police)



M.V. "IRVING TIMBER", stern ramp operating controls.

Commandes de la rampe arrière du N.M. "IRVING TIMBER".

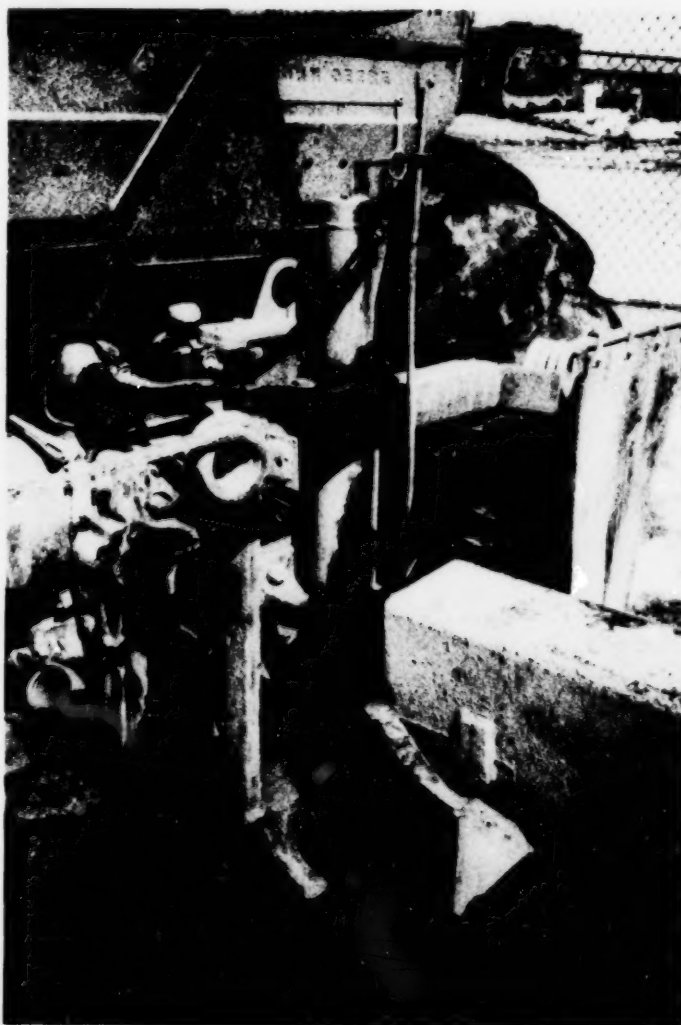


Concrete ramp, Berth 1A, Forterm.

Rampe en béton du poste d'amarrage 1A à Forterm.



Tractor and trailer unit. Tracteur et remorque.



Tractor and trailer
hitch system.

Dispositif d'attelage
du tracteur et
de la remorque.